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● is raised and so wanting in covetousness is the husbandman, that after the crop is gathered in, more remains in the fields, than is to be had for a harvest here in Sonora—this upon the authority of a Missionary Father who saw it with his own eyes in the year 1757.⁷² Similarly, Font,⁷³ who visited the Pima along the Gila River while on his journey to Monterrey in 1775-76, wrote that they planted, spun and wove cotton into fabrics, garments and blankets; this was also observed by Garcés. Whittemore⁷⁴ stated in 1893 that it was cultivated more than a hundred years before his time. Likewise Oñate's⁷⁵ party, which made an expedition to California in 1604-05, observed that Indians along the Gila had cotton mantas, but these were evidently the Maricopa.

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Bartlett, Emory and Whipple⁷⁶ reported that a considerable amount of native cotton still was being grown and used by the Pima between 1846 and 1850, and in 1873 Grossmann⁷⁷ found them still growing small amounts. The Pima have grown cotton commercially for a number of years, and as early as 1864 the Superintendent of Indian Affairs for Arizona stated that he had furnished the Pimas with five hundred pounds of commercial cotton seed.⁷⁸

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Russell⁷⁹ pointed out forty years ago that from pre-Spanish days down to the last quarter of the nineteenth century the Pima cultivated cotton for the fiber, as well as seeds for food. However, cultivation of the aboriginal product gradually diminished, until by 1901-02 it had so nearly ceased that it was only with difficulty that a sufficient amount of raw cotton of Pima raising was secured to weave a small piece of

⁷² Rudo Ensayo, p. 128.

⁷³ Bolton, *Anas*, IV, 44, 49; Coues, *On the Trail*, I, 107-08.

⁷⁴ Whittemore, in *Among the Pimas*, p. 52.

⁷⁵ Hammond, *Don Juan de Oñate*, p. 167; Bandelier, *Final Report*, I, 110.

⁷⁶ Bartlett, *Narrative*, II, 223-29; Emory, *Notes*, pp. 83-5; Whipple, *Official Report*, pp. 598-99.

⁷⁷ Grossmann, *The Pima Indians of Arizona*, p. 419.

⁷⁸ Report of the Commissioner of Indian Affairs for 1864, p. 153.

⁷⁹ Russell, *op. cit.*, p. 77.

Pⁱ melons. Informants were aware that, although chili requires
312 considerable moisture, it usually dies when planted on flat
irrigated ground, hence it was sowed on the sides of raised
field borders in hills about eight inches apart. Pima and
Pⁱ Papago grew chick peas as a winter crop, planting from
Pⁱ November 1 to early December. Papago awaited the winter
312 rains before sowing, while the Pima heavily irrigated the soil
before planting and gave the plants comparatively little water
afterwards. In no case were they irrigated after blooming
began. Garden peas needed frequent watering and could be
grown only where there was a permanent source. Wheat was
usually irrigated about four times.

Neither Pima nor Papago carried water to plants (other
than gourds, which were sometimes watered by hand) to
tide over periods of drought, although informants had heard
that the Maricopa did so.

Neither tribe had any ritual for irrigation. One Papago
informant said getting water on the fields was not a matter
of ceremony but of brain work.

SOIL FERTILITY AND CROP ROTATION

Pⁱ Fertilization of the soil was not practiced aboriginally by
● either Pima or Papago, yet soil depletion to the extent of
● 242 necessitating abandonment of fields was extremely rare. Pima
land was continually replenished with mineral and organic
materials deposited by the river in times of overflow; similarly,
Papago fields were naturally fertilized by flash floods.
The fact that many of the Piman fields have been under cultivation
for hundreds of years, producing sustained crop yields without the
addition of manures or other fertilizers, is evidence that considerable
plant nutrients were carried by the waters used for irrigation in the
Gila Basin. Allowing fields to lie fallow in order to build them up was
unknown, although it was recognized that new ground produced larger
yields than the old.

PLANTING, IRRIGATION AND CULTIVATION

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Neither did these people anciently rotate crops to conserve soil fertility. Today, however, it is known that crops such as small grains and sorghums soon deplete the land and result in reduced yields if grown on the same soil repeatedly, so for a number of decades the Pimans have planted crops of maize, beans, pumpkins, melons etc. on ground from which the wheat was harvested in May or June. Pi
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CULTIVATION

Four being the Piman ritual number, it was supposed to take maize four days to germinate and all informants insisted maize, teparies, pumpkins, watermelons and black-eyed beans were up in four days, that pink beans and lentils required five to six, wheat ten days. If the surface of the ground caked, seedlings other than maize with its pointed shoot had some difficulty in breaking through, and in such cases they were usually assisted by removing or pulverizing the clumps of soil around them. One Papago informant said that in farming *everything had to be taken care of*, even to the extent of aiding plants to break through the ground if necessary. Another stated it was not the purpose of the Papago to let plants grow by themselves but that all cultivated plants have to be taken care of and be helped by human hands, and one can not take things for granted. Informants advised that there was no ritual for cultivation since there was nothing could be done in a field to secure good crops except cultivate, and that if this were not done, poor crops would result. Another perspective on Papago industry and outlook was given by Chico Bailey, who, upon being asked whether the Papago ever abandoned fields because of erosion, said the proper thing for the farmer in a dry-farming area to do is stay on his land, work it and not abandon it; that there was nothing to be gained by moving elsewhere.

The soil was worked customarily at planting time and again when crops were cultivated, also a third time if condi- Pi
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241 cally, it was a family enterprise and all able members of the family worked more or less together. A few families worked reciprocally in cultivating.

Thinning out of crops was never done; in fact, it was not necessary since the planter was always careful not to put more seeds in a hill than the number of plants desired, the ideal number per hill being three to five. It was well known that if plants were too thick in the hill they did not do well because of competition for food, water and space, and that corn, for example, under such conditions produced thin stalks with poor ears or none at all. Ends of pumpkin and melon vines were sometimes broken off to increase the production of fruits, but this was probably not an aboriginal practice.

Ceremonial copulation in the fields to increase their productivity was unknown.

CONTROL OF CROP PESTS

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242 Young plants were not protected from animals and wind by branches from shrubs or trees as was done by some tribes. Pieces of cloth were sometimes placed on sticks and set up in the fields to scare birds away, and crude scarecrows were also made, although it is doubtful that this practice was aboriginal.

Anciently, as now, the Pimans were bothered by various pests. Grasshoppers at times caused considerable damage and one Papago informant had distinct remembrance of two different occasions when the grasshoppers completely destroyed his grandfather's tepary crop. Little was done by way of control other than an attempt to drive them out of the fields with weeds of various kinds attached to arrowweed branches and set afire, thus making considerable smoke. After the Pima began to grow wheat, the stubble was sometimes burned in an attempt to rid the fields of pests. Locusts were reported in 1897⁶⁵ as having eaten almost all the crops that had been

⁶⁵ Report of the Commissioner of Indian Affairs for 1897, p. 110.

planted at San Xavier. Squash bugs were fairly common but ^{Pi} the only attempt at control was sprinkling ashes on the vines, ^{Pu} probably not an aboriginal practice. Cut worms gave little ²⁴² trouble, so nothing was done about them. Rabbits usually came at night and caused some damage; at times the Pima attempted to drive them out of the fields with arrowweed firebrands, but with indifferent success. Papago usually planted their chick peas and lentils in the middle of a wheat field to protect them against rabbits, otherwise these were damaged considerably. When corn began to come up, birds, especially blackbirds and doves, ate the young seedlings, so boys and girls were sent into the fields to drive them away, usually in the morning and evening. There was no watcher's stage. Children protected plants particularly when they were coming up and again when the crop was ripening. On the Gila, quail have caused considerable damage to pink beans by eating the blossoms, although the desert Papago were little bothered in this respect. Various birds ate the young pods of cowpeas. After the coming of the Spaniards, an interesting ^[223] method of controlling birds that were especially annoying in digging out planted corn grains or seedlings was to tie one end of a horse hair to an earthworm, the other to a stick. When the bird swallowed the worm it found itself unable to escape, was captured and killed.

Pima and Papago native maize was, and still is, little troubled with corn smut. Rust on wheat and barley sometimes was observed; Pima informants knew it was not spread as the result of irrigation, but often became worse in rainy, cloudy periods. There was little remedy for this except to pull up badly infected plants or burn the stubble to prevent spreading. Rusty wheat was cleaned of much of its rust just before using by washing in watertight baskets. The grain was placed in the basket with water and rubbed by hand, the water being changed when dirty. This was woman's work. Aphis was an annoying pest on watermelons and muskmelons. Ants, too, did considerable damage to young wheat plants, particularly

- Pi' after irrigation. Gophers were said to like watermelon roots
- Pa better than any other food. They were killed with bow and
- 242 arrow.

Within recent times Johnson grass and Bermuda grass have become established in Pima fields and in those of the Papago at San Xavier, and have constituted a definite annoyance in cultivation.

Chili, which was rather immune to pests, was damaged chiefly by excess moisture which promoted fungal attack of the roots and bases of stems, and by the excessive heat of summer causing blossoms to drop off.

The various fungi attacking crops were regarded as natural agencies. Among neither people was there any ritual or ceremony for cultivation or ridding fields of pests.

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251 It was, of course, impossible to store different colors of corn separately, for cross pollination naturally resulted in considerable mixture. However, this was done to the limits of practicability and ears of similar colors were placed together in separate piles when husking.

Seed Selection

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242 Informants had little knowledge of the hereditary background of crop plants. Both Pima and Papago thought good crops resulted from good culture and that good qualities did not reside "in the blood." These Indians were not interested in the "sports" for they were regarded as freaks. Selection of seed corn was done by women largely, since they were the ones who did whatever husking was done, although this was not their special prerogative. While husking, good ears were put to one side and saved, or, in some cases, ears for seed were selected out when husked ears were being shelled. In no case were ears selected from the plants while standing in the field. The chief criteria were well-developed, mature, plump, clean, large grains, and little attention was paid to size or shape of the ear, or whether the grains were in regular rows. Ears badly worm-eaten were never selected for seed. All grains on a good seed ear were planted, for it was believed the ones at tip and butt were as good as those in the middle. However, the practice has now been modified in that tip and butt grains are not used for seed. Care was always exercised to keep seed corn pure as to color, so it was always taken from ears of unmixed solid colors.

It was not considered advisable to use corn that was more than two years old for seed, as it would not germinate well. Fresh seed was always planted if possible; however, seed left over in any year might be saved for planting the next.

Storing Seed Corn

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251 Even with considerable care, rats, mice and weevils sometimes got into maize stored in baskets. Hence, when shelled

5: Castetter & Bell N-5 (1938-1940) 1942

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Pima ^{Pi}NU29

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develop into fruits. A quantity was gathered early in the morning and, after removing the calyx, dried in the sun on a mat or cotton cloth for about three days, then stored in a sealed olla. When used they were cooked with mesquite beans. At times, they were mixed with cornmeal and boiled, the mixture spread out on grass or a cloth to dry for about three days, and stored in ollas. This was again boiled when utilized. Twisted flowers, after removal of the green calyx, were also boiled and eaten with pinole. ^{Pa}252

Papago and Pima regarded pumpkin seeds as a delicacy. These were parched by placing in a piece of olla with live coals, stirring until done, and eaten much as we eat peanuts; or at times these seeds were parched with corn. ^{Pi}^{Pa}262

Seed Selection

Pumpkin seed was selected in a general way (by either the man or woman) by simply taking those from the largest pumpkins, size being the most important criterion. Or, if a pumpkin proved to be especially sweet, the seed was saved. This was placed in a small olla with others of the same variety and, when sowing time came, a quantity was taken from the olla and planted without culling out individual seeds. ^{Pi}^{Pa}242

TEPARIES AND COMMON PINK BEANS

Time of Harvest

The Papago made only one planting of teparies—in July and harvested in October. The Pima made two; their first planting, as mentioned earlier in this chapter, was made when mesquite began to leaf out, the second soon after sahuaro harvest. The first was mature in late June, the second in October. ^{Pi}^{Pa}244

Informants said if maize and teparies were planted at the same time the maize would be ready to harvest before the teparies, which required a minimum of ten weeks under favorable moisture conditions. They invariably matured

Seed Selection

There was no seed selection of teparies or pink beans. ^{Pi} _{Pa} ●
 Seed to be planted was simply taken out of the general stored ²⁴² supply at planting time. ●

COWPEAS (BLACK-EYED BEANS) AND LIMA BEANS

With the coming of the Spaniards, cowpeas, which, despite ^{Pi} _{Pa} ²⁴⁴ their name, are more closely related to the beans than peas, were introduced among the Pimans. Planted by the Papago in July, and by the Pima in late March or early April and in some cases again after sahuaro harvest in July, the pods were harvested progressively as they ripened, since plants would grow indefinitely as long as weather conditions permitted, although quite susceptible to frost. Informants said one could begin picking the long pods about eight weeks after planting, those near the base ripening first. At the time of general harvest, the pods remaining on vines were still somewhat green, so the vines were piled and allowed to dry for a week or more before being threshed. Threshing was done by beating with a stick or, if the quantity were small, by hand.

Like black-eyed beans, the single sowing of lima beans (made by the Pima in late March or early April and by the Papago in July) was harvested progressively throughout the growing season as the pods ripened, and the growth of plants was terminated only by frost or lack of moisture. Among the Pima, whenever plants began to fall off in production of pods they were irrigated, whereupon a new crop began to set. The first pods were ready to pick when mesquite beans were fully ripe. Although limas stand drought well, their yield is closely associated with the amount of water they receive, hence, at present they are more extensively grown in the Pima than in the Papago country. Usually women picked the pods and shelled them by hand. However, when families grew a considerable quantity they were placed on the ground on a large cotton cloth and trampled out by foot. The

Pi empty pods were then removed by hand and seeds winnowed
 Pa to remove chaff. The Pima now plant limas in June or July
 244 and they yield better if not irrigated too heavily.

Limas and black-eyed beans were usually planted in smaller amounts than teparies and pink beans, hence the quantity of seeds secured at any one picking was small.

Pi As with teparies and pink beans, the harvesting of limas
 Pa and black-eyed beans was accepted as woman's work.
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Seed Selection

Pi There was practically no selection of seed for limas or
 Ac cowpeas, and seed to be planted was simply taken out of the
 242 general supply with no discrimination other than discarding shriveled ones. Informants said one never got poor seed of these crops unless it was immature as the result of injury by early frost. The only precaution was to use fresh seed, for it was known that these beans lost viability rather quickly.

CHICK PEAS AND LENTILS

Pi Both chick peas and lentils were recognized by the Pimans
 Pa as introduced crops. Pima and Papago grew chick peas, or
 244 garbanzos, to only a small extent, and lentils even less, although both were regarded as very nutritious. The chick pea is well adapted to arid and semi-arid regions and matures in about ninety days. Both Pima and Papago made a single planting, sowing them as a winter crop from November first to February and harvesting in April or May, consequently they required little moisture. It has been reported that garbanzos will endure a temperature of 13° F. without being injured. People began to harvest chick peas when mesquite beans were about ripe, and picked them progressively. The first pods to ripen were simply rubbed by hand. When the plants began to dry up, tops were cut off with a sickle or pulled up, piled and dried for a few days, then threshed by beating with a stick or trampling. They were then winnowed, dried further and stored in a sealed large gourd or olla. On

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²⁴⁸ ripen before being picked. Of course, at present, with the commercial growing of cotton, Pima pick the cotton from the open bolls directly off the plants in the field.

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● ²⁴⁹ Cotton seed was stored in sealed ollas in exactly the same manner as were teparies. There was no selection; seed for planting was simply taken from the general supply stored for food.

Utilization of Cotton

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²⁵¹ Cotton was grown for both lint and seeds. The lint was used for cordage, cloth, garments and tinder. Tinder was prepared from a cotton rope about one-half inch thick, several inches long and frayed at one end, used especially for lighting cigarettes. Sparks made by pounding two pieces of flint together ignited the fiber. Its use as tinder may be a Spanish introduction.

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²⁵² Cotton seed was parched and eaten much like we use pop corn. The seeds were placed in an olla with embers of mesquite wood on top. The olla was continually shaken and the live coals soon parched the seed. Another way of utilizing the seed was in combination with mesquite or cornmeal. Mesquite pods were pounded fine with a wooden mortar and pestle, seeds removed, and the flour mixed with that secured by pounding parched cotton seeds in a mortar. The two were then mixed and molded into a sort of cake-like tortilla, baked in ashes and eaten. A combination of cotton meal and cornmeal was utilized in the same way. Informants said either mixture tasted like, and had the texture of, tallow. From the pounded seeds Papago and Pima made a kind of bread which was baked in hot ashes. At times, water was added to pounded cottonseed meal, strained, and the liquid used as seasoning in cooking. The strained meal residue was sucked in order to remove the nutriment, and the pulp discarded.

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²⁵³ Papago informants stated cotton was used ceremonially on their prayer sticks to symbolize clouds, and thereby invite rain. Pimas preferred eagle down for this purpose.

5: Castetter & Bell N-5 (1938-1940) 1942

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Sima NU29

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layers of wheat straw or bean vines, and watermelons. Sides^{Pi}
of the pit were not lined. For a roof, poles were laid across^{Pa}
the opening and a layer of arrowweed covered with dirt over²⁵¹
all. Earth at one end of the pit was dug away to allow a
vertical entrance about three feet high, which was covered
with a framework of slender poles. Watermelons thus stored
kept well for as much as three to four months. Informants
said they kept better if a six-inch section of the vine was left
attached to the fruit at the time of picking.

Watermelon and muskmelon seed for planting was always^{Pi}
selected on the basis of size and quality of fruits, thus from^{Pa}
the largest and sweetest specimens. [242]

Utilization

Fruits when ripe, particularly watermelons, were com-^{Pi}
monly eaten fresh in great quantities, although at times^{Pa}
preserves were made from the rind by cooking without^[252]
sweetening. Watermelons were never dried. Muskmelons
did not store well so had to be eaten relatively soon after
maturity, or dried for future use.

The method for drying muskmelons was similar to that
described for pumpkins, except that the melon was peeled
and cut lengthwise, the soft pulp and seeds scraped away.
Only thoroughly ripened fruits were used in this manner.
The short straight strips were then dried on top of the house
or *ramada* for several days, or until they could be worked
well. A number of strips were placed side by side and tied
into bundles, dried further on a shed, twisted into hanks and
stored in baskets, or in ollas with a cloth over the contents,
covered with a piece of broken olla, then sealed with mud.
In spring they were eaten dry without boiling or preparation
of any kind unless they had become quite hard, in which case^{Pi}
they were boiled and eaten with pinole. At times the dried^{Pa}
melon was toasted over a fire to soften, then eaten by alter-^[264]
nately taking pieces of melon and drinking pinole. This
practice is very rare today. Unlike pumpkins, such dried